temperature, the contraction of the semiconductor substrate applies to the coat film during a temperature fall, and the residual stress is further increased. The above described residual stress is one of the factors of a crack which occurs during film forming or after film forming. Therefore, in order to reduce the residual stress, it is desired that the heat treatment in the step 4 be carried out by setting the substrate temperature to a temperature not more than 500℃.

However, if the temperature was too low, bridge reaction such as dehydration reaction is not accelerated, and a desired mechanical strength is not be obtained. According to research made by the inventors, it is found that at least a heating temperature of 200℃ or more is required to effectively accelerate reaction such as dehydration reaction. From the foregoing, the heating temperature is set to 400℃ in the present embodiment.

Further, when the step 4 is executed, the pressure in the reactor chamber is set to not more than 400 Torr so as to prevent the surface of the coat film from being oxidized by oxygen in atmosphere, and the oxygen concentration is restrained to not higher than 100 ppm. In the present embodiment, the electron beam treatment is carried out in the nitrogen atmosphere of 40 Torr or 60 Torr.

In addition, in order to maintain the uniformity

of electron beam irradiation under the above condition, a hot plate 25 is placed at a position of 75 mm from the lower end of the electron beam generating section 22, and the electron beam irradiation is carried out in the present embodiment.

Now, characteristics of the insulation film (interlayer insulation film 3) formed in accordance with the method of the present embodiment will be described here.

Table 1 shows relative dielectric constant and crack resistance film thickness in insulation films (polymethylsiloxane film) formed by process of the present embodiment, a process A (only heat treatment), a process B (heat treatment and electron beam irradiation, the pressure in the reactor container: 40 Torr), and method C (heat treatment and electron beam irradiation, the pressure in the reactor container: 60 Torr). In the process B, the irradiation quantity is set to about 5 $\mu C/cm^2 \cdot sec$, and the electron beam irradiation time is set to 120 seconds. In a process C, the irradiation quantity is set to about 4 $\mu C/cm^2 \cdot sec$, and the electron beam irradiation time is set to 120 seconds.

The relative dielectric constant is measured by using a mercury probe technique. The crack resistance film thickness film thickness is a thickness when cracking is observed visually or with an optical

microscope.

Table 1

	Embodiment	A	B	C
Relative dielectric constant	3.03	3.01	3.03	3.20
Crack resistance film thickness (μm)	1.8	1.2	1.3	1.9

The insulation film formed by the process of the present embodiment has a relative dielectric constant of about 3.0 that is nearly identical to that formed by the process A. With respect to the crack resistance film thickness, the insulation film formed by the process of the present embodiment is improved by 1.5 times as compared with that formed by the process A.

The insulation film formed by the process B has a relative dielectric constant of about 3.0 that is nearly identical to that formed by the process A. With respect to the crack resistance film thickness, the insulation film formed by the process B is found to have been improved by 1.1 times as compared with that formed by the process A.

The insulation film formed by the process C has a relative dielectric constant that is greater than that formed by the process A. With respect to the crack resistance film thickness, the insulation film formed